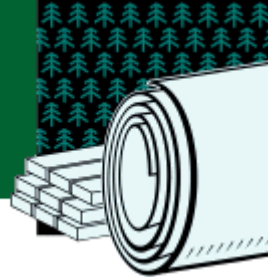


FOREST PRODUCTS

Project Fact Sheet



UNDERSTANDING THE NATURE AND REACTIVITY OF RESIDUAL LIGNIN FOR IMPROVED PULPING AND BLEACHING EFFICIENCY

BENEFITS

- Greater understanding of the chemical nature and reactivity of residual lignin
- Increased productivity through a facile removal of the residual lignin
- Simplify the bleaching processes
- Improved environmental performance of pulping mills
- Fewer and more efficient steps in the bleaching process
- Improved competitiveness of the U.S. paper industry in the global market

APPLICATIONS

At the conclusion of this effort, the pulp and paper industry will be provided with information that can be applied to improving its pulping and bleaching efficiency.

Research into the Chemical Nature of Lignin Will Improve the Kraft Pulping Process

During the kraft pulping process, it is very difficult to remove more than 90 percent of the lignin without degrading the quality of the fiber. The quality and stability of kraft pulps could be improved significantly if a bleaching technique were available to selectively remove the last 10 percent of the lignin. The problem is even more of a challenge in light of current environmental concerns that industry use only elemental chlorine-free or totally chlorine-free bleaching processes. It is known that oxygen-based bleaching processes can remove about 50 percent of the residual lignin. Chlorine dioxide bleaching has also been used commercially for pulp bleaching, but does not yet achieve the desired level of delignification.

A better understanding is needed of the chemical nature of lignin condensation reactions in order to reduce or eliminate the need for chlorine bleaching. In analyzing the residual lignin, researchers have stated that more than 50 percent of the phenyl nuclei present in kraft cooked softwood pulps are associated with diphenylmethane (DPM)-type structures and that lignin condensation reactions appear to play a significant role in the alkaline delignification process. However, a new method is needed to obtain more data in order to verify these suggestions.

To gain this information and give industry access to the residual lignin, researchers plan to develop techniques that can be applied to the lignin in situ rather than to isolated samples from the cell wall matrix. By looking at the whole lignin, they will not have to consider the chemical changes inherent in the isolation process.



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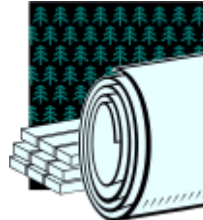
PROJECT DESCRIPTION

Goal: To gain an understanding of the nature and reactivity of residual lignin for improved pulping and bleaching efficiency.

In the first year of the three-year effort, a direct procedure will be sought for measuring the DPM-condensed units and using the method to evaluate the significance of lignin condensation reactions in kraft pulping of softwood. In year two, the reactivity of kraft pulp lignin will be determined in situ, as well as the impact of pulping conditions on the nature of residual lignin. The third year will be taken up with determining the impact of pulping conditions on the reactivity of residual lignin in situ, and preparing a final report.

PROGRESS & MILESTONES

- Develop a direct procedure for measuring DPM condensed units
- Understand the reactivity of DPM dimers toward non-chlorine agents
- Determine the significance of lignin condensation reactions in the kraft pulp residual lignin formation
- Clarify the reactivity of residual kraft pulp lignin in situ
- Understand the influence of pulping conditions on the nature of residual pulp lignin
- Determine the influence of pulping conditions (temperature, alkalinity, sulfide content, and additives) on the reactivity of residual pulp lignin in situ.



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